Thesis/
Reports
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PRESCRIBED BURNING
PURPOSES AND PROCEDURES

by
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W. LINDENMUTH

PRESCRIBED BURNING

PURPOSES AND PROCEDURES

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ROCKY MOUNTAIN STA

George K. Schaeffer
District Forest Ranger
Osceola National Forest
October 7, 1955

PURPOSE

1. Rough and hazard reduction

Removing fuel so wildfires will be more easily handled and cause less loss of timber.

Example: Osceola 157,000 acres, established 1929-31

5 year period	Average loss/year	Pres. burn program
1939 - 1943	5,104 acres	None
1944 - 1948	405 acres (92% red.)	Started FY 1944
1949 - 1953	259 acres (95% red.)	Continued

Volume & Cost

Acres burned: 14,800 to 27,890 acres/year, average 11 years -21,762

Cost: Planning - 10%
Plowing - 50% (period up to 1949)
Burning - 40%

Min. $.096 to .223 / acre

Most recent: F.Y. 1954 - $.178/ acre
F.Y. 1955 - $.200/ acre (dry year)

2. Seed Bed Preparation

A burn prior to seed fall to permit seed to reach mineral soil to germinate.

(Usually September burns, or better regular burns half year before. Light rough will reduce amount of seed lost to birds.)

Example: Large area of longleaf pine seed trees of Francis Marion National Forest burned for this purpose. Catch resulted in stand of 100,000 seedlings per area.

PURPOSE

3. Planting Site Preparation

Burn before planting seedlings.

Rain after burn and before planting. (Early burn.)

Advantages

Fireproof area for first year.

Reduce rough for easier control of fires that may start.

Easier to plant - see stumps and remove debris.

May reduce competition to some extent.

Preferable to burn entire block rather than only planting site to reduce cost. (.50 per acre.)

4. Brown Spot Disease Control

Disease of grass stage longleaf pine, which in severe case will prevent height growth and/or kill the seedlings.

Burning is essential to control disease.

5. Hardwood Control or Stand Conversion

Climax type of southern forests is hardwoods (tolerance of shade), where fire is eliminated.

Fire is used to control understory hardwoods, it seldom can be used to eliminate them. Elimination is possible (50%) with June fires, but is not recommended for South Georgia because of beetle attacks following burns. (Research Note #19, Southeastern Forest Experiment Station, October 1952.)

Fire cannot substitute for stand conversion work where large cull hardwoods are present. They must be removed by mechanical means, or by girdling and use of herbicides.

PURPOSES

6. Grazing

Winter burns temporarily provide advantages during spring months.

1. Protein and phosphorus content 2 - 3 times greater.

2. Lignin content appreciably lower.

3. Grass more easily available than in rough.

4. Enables cattlemen to gather stock on burns for branding, etc.

5. Increases carpet grass, but decreases some important bunch grasses.

6. Reduces incendiary fire problem.

   Osceola dropped from average of 14 incendiary fires / year to 4 / year.

7. Habitat Improvement For Wildlife

1. Increases deer forage from hardwood sprouts, which deer can reach.

2. Improves turkey range, more open undergrowth, less loss from predators.

3. Quail do better on open areas, however on well stocked forest there are few quail.

PURPOSE

8. Reduction of Lightning Fires in Dry Years

Lightning strikes may accompany storms with or without rain.

The heavier the rough the less likely it is to be wetted through by light rains. The lower portions of the fuel on the ground remain dry and are more easily ignited by the lightning strikes.

	Age of rough						
Lightning Fires	1	2	3	4	5	Pond	Total
Occurrence 1954	0	2	4	4	14	14	38
Occurrence 1955 (Sept.30)	0	1	4	8	17	4	34
Average 1954-1955	0	1.5	4	6	15.5	9	36
Probable number with no burning	15.5	15.5	15.5	15.5	15.5	9	86.5
Probable number 4 year schedule	0	1.9	5.0	7.5	--	9	23.4

Reduction in Fires Due to Prescribed Burning

Condition	Number Fires	% Reduction in Number
Without burning	86.5	----
5 year schedule	36.0	58%
4 year schedule	23.4	73%

There is also a reduction in size of fires and acreage losses.

Importance of Lightning Fires in Protection Program

1939 - 1943 - 1/4 of total fires caused by lightning

1944 - 1948 - 1/3 of total fires caused by lightning

1949 - 1953 - 1/2 of total fires caused by lightning

1954 - 1955 - 2/3 of total fires caused by lightning

PURPOSE

9. Reduction of Timber Sale Operator Fires in Dry Years

Reduce number of fires by removing the inflammable fuel. Coordinate prescribed burning plans with timber cutting plans so operations will be on roughs no older than 1 or 2 years.

Osceola Study - 1954

Age of Rough	Number of Sales	Number of Fires	Fires Per Sale
1 year	7	0	None
2 year	3	0	None
3 year	8	3	1 fire on each 3 sales
4 year	4	2	1 fire on each 2 sales
5 year	3	4	1 fire or more on each sale

Osceola Study 1955 (through September)

Sales all made on 1 or 2 year roughs.

No fires on prescribed burned area. 4 fires occurred in ponds, which were easily stopped on the ridge.

10. Other - Miscellaneous

1. Reduction of cost of marking or tree measuring timber by increasing production per man day, and by improving the quality of the marking.

2. Increase in stumpage value. Heavy roughs are not desirable chances. Before burning some national forest areas could not be sold.

3. Protection strips - for property or improvements.

4. Reduction of pine stems - impracticable.

5. Elimination of ticks, snakes, and other pests - questionable.

WHAT TO BURN AND WHAT NOT TO BURN

Burnable	Not Burnable
1. Slash pine 8' to 12' or over.	1. Areas set up for hardwood production.
2. Longleaf pine 6' to 8' or over.	2. Pine ponds or swamps (roots near surface- cause beetle attacks.)
3. Longleaf pine - grass stage.	3. Uneven aged stands with high percentage of slash reproduction.
4. Even aged stands with small openings not expected to reproduce. (Calculate cost bases on production, man/hours, equipment costs, for acreage in area to be eliminated.)	4. Longleaf pine just started height growth up to 6' height.

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Damage: A properly prescribed burn stand will show no significant difference in height or diameter growth in trees 12 feet or taller, as compared with an unburned area.

Damage is usually estimated from amount of crown scorch.

0 - 35% scorch -- zero to negligible damage.

36 - 66% scorch -- moderate damage.

66 - 100% scorch - severe damage.

Severe damage is defined (100% scorch) as resulting in loss of about the equivalent of 1 years growth spread over 3 years. (0.6 in first year, 0.3 in second year, and 0.1 in third year.)

WHEN TO BURN

Weather

1. Cold front with light rain day before burn; or with heavy rain two days before.

2. Northerly winds predicted for day of burning and following day, (in case burning is not completed the first day.)

3. 3 to 8 mile winds, stable. The higher the wind the less the scorch. But the higher the wind, the more difficult to control because of back-fire spotting over.

4. Temperature preferably below 60 degrees F. The lower the better.

General

Obtain weather reports from reliable source.

Highs cross country on easterly courses. When passing north of burn area, winds will rotate clockwise; when passing south of area, winds will rotate counter clockwise. In recent years this counter clockwise movement has been quite common, and plowing and burning on the Osceola was varied to take advantage of westerly winds as well as northerly.

Up to date movement of highs is seldom obtainable in time to help the burning boss. He must observe the wind directions and trends and plan his burning as his judgment dictates.

Period

Dormant months - latter part of November to end of February.

In north Florida the best conditions and burning have occurred in December, because of more stable winds.

F. Y. 1954 Burning Periods

Burn Period	1953-54 Dates	Weather	Remarks	Acreage Burned
1.	11/24	Rain	No burn - too wet	
	11/25	Cold	No burn - too wet	
	11/26	Cold	No burn - wind shift to SW	None
2.	12/9	Rain	No burn - too wet	
	12/10	60° 3-7 NW Steady	Set M & N (out night) (2900 acres)	
	12/11	50° 3-7 M NW Steady	Reset M&N (out at night - too wet)	1,000
3.	12/13	Heavy rain		
	12/14	Cold	No burn - too wet	
	12/15	35° - 40° 3-6 M NW Steady	Reset M&N, Set 20E, 22A, 23E (5,460 acres)	
	12/16	40° 3-6 NW steady	Reset above - Set 19E, 19F (2,650 acres)	
	12/17	38° 4-7 NW steady	Reset above - Set 5A, 5C, 21A, 21C, 8C (6,690 acres)	
	12/18	30° 4-7 NW steady	Reset above - set 9B (870 acres)	
	12/19	50° 3-6 northerly	Reset above - completed blocks	15,670
4.	12/23	Rain	No burn - too wet	
	12/24	Rain		
	12/25	Rain		
	12/26	Cold		
	12/27	Cold		None

F.Y. 1954 Burning Periods (Cont'd)

Burn Period	1953-54 Dates	Weather	Remarks	Acreage Burned
5.	12/30	Rain	No burn - too wet	
	12/31	Cold	No burn - too wet	
	1/1	Cold	No burn - wind shift to westerly	None
6.	1/7	40° 3-7 NW shifting	Set Approx 6,000 acres (for westerly winds)	
	1/8	40° 3-7 westerly	Reset and completed on westerly winds	6,000
7.	1/11	Rain		
	1/12	42° NW	Not set - too wet	None
8.	1/22	Rain		
	1/23	40° NW-N	Set 13A (no more - wind not steadv) 900 acres	
	1/24	Cold	Reset and completed	900
9.	1/28	40° No rain Cold front	Reset areas not completely burned out 13A, 19E & F, 20E, M, N	√
10.	2/4	40° Westerly No rain - cold front	3D, F - burned on westerly winds (2240 acres)	
	2/5	Cold westerly	Reset	
	2/6	Warming westerly	Reset - burned out early in day	2,240
Burning program completed				23,937

Burn weather periods	Non-Usable	Usable	Usable #days
10	4	6	15

WHEN TO BURN

Night burning is good if conditions are right. (Initial burns).

Requires:

1. No dew (because of low temperature)
2. Continuing, steady wind. (Sometimes lulls at night).
3. Requires dryer fuel condition or heavier fuel so fire will not go out or finger.
4. Requires more supervision and labor because they are not as effective at night.
5. There is little difference in control of breakovers.

10 - 15 year roughs night burning can be good.

Day burning results are as good or better than night burning (later burns).

Where second burns or light roughs are burned, it is better during the day, because of high humidity at night, which will cause fire to go out or finger.

PLANNING

Division of forest property into burning blocks with natural boundaries and of economic size.

The establishment of burning blocks should conform with the following rules to assure the maximum advantage not only in cheaper and easier burning, but to allow the landowner to coordinate the burning program with his resource management plans.

1. Should cover same area as management compartment, or a sub-division of it. (Sample map.)

2. Should have natural or road boundaries, which normally will serve as adequate fire breaks without additional work. (Sample map.)

3. Should be of sufficient size.

Osceola examples:

Number compartments -- 40

Number burn blocks -- 123

Minimum size -- acres - 299 gross, 277 net

Maximum size -- acres -2600 gross,1959 net

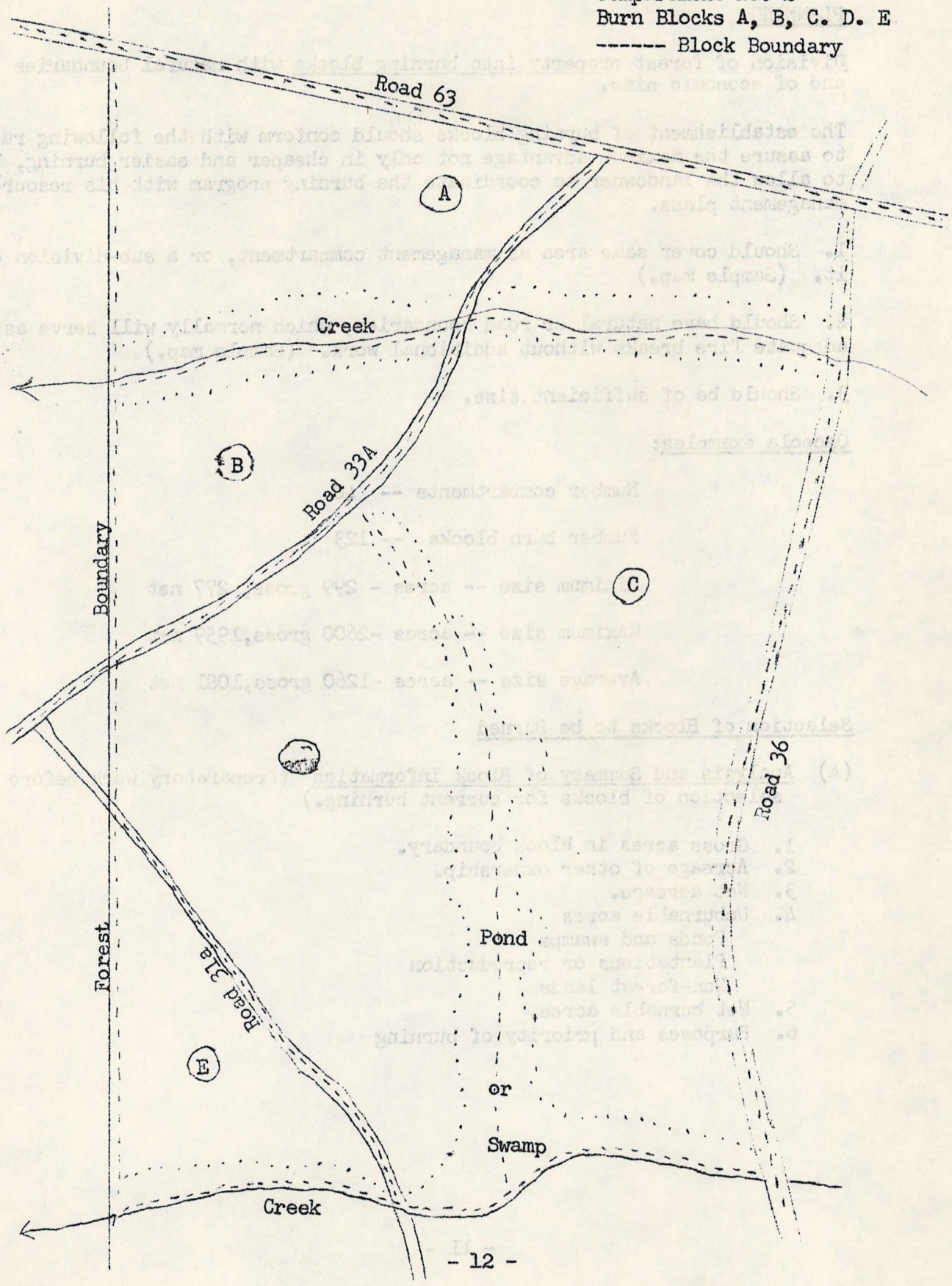
Average size -- acres -1260 gross,1081 net

Selection of Blocks to be Burned

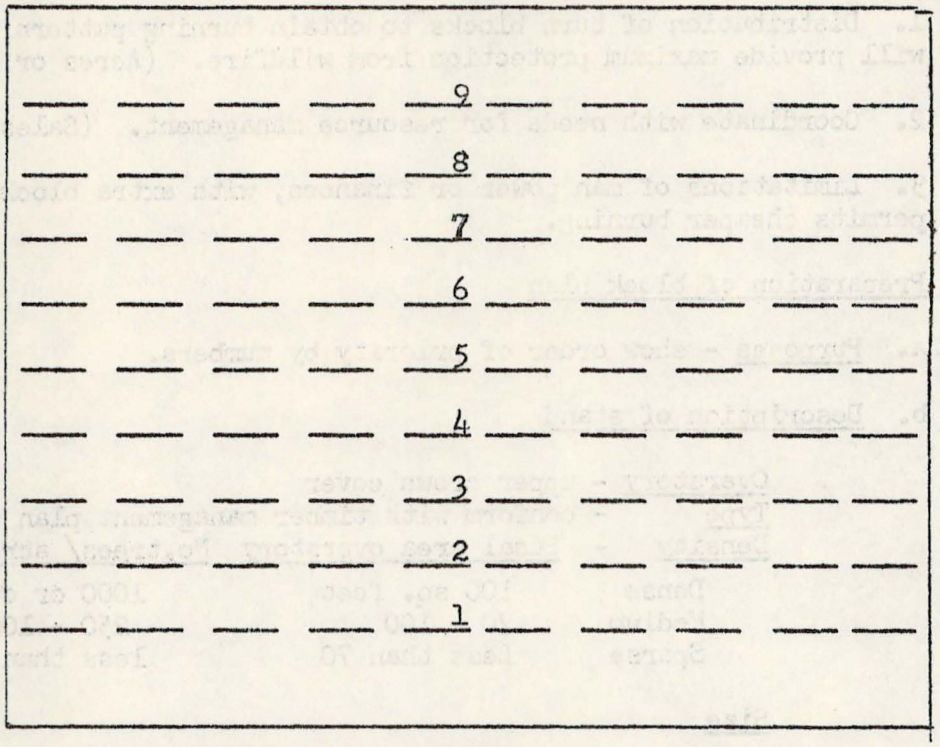
(A) Analysis and Summary of Block Information (Preparatory work before selection of blocks for current burning.)

1. Gross acres in block boundary.
2. Acreage of other ownership.
3. Net acreage.
4. Unburnable acres
   - Ponds and swamps
   - Plantations or reproduction
   - Non-forest lands
5. Net burnable acres.
6. Purposes and priority of burning

Compartment No. 2
Burn Blocks A, B, C. D. E
------ Block Boundary



Planning Burn Blocks - Economic Size and Boundaries



1000 acres - 100 chains on side

Size of Block	Interior Lines	Exterior Lines
1000 acres	900 chains	400 chains (44%)
640 acres	560 chains	320 chains (57%)
160 acres	120 chains	160 chains (133%)

PLANNING

(B) Selection of blocks to be burned this season

1. Distribution of burn blocks to obtain burning pattern which will provide maximum protection from wildfire. (Acres or value.)

2. Coordinate with needs for resource management. (Sales, planting.)

3. Limitations of man power or finances, with extra blocks if weather permits cheaper burning.

(C) Preparation of block plan

a. Purposes - show order of priority by numbers.

b. Description of stand

Overstory - upper crown cover
Type - conform with timber management plan
Density -

	Basal area overstory	No. trees/ acre understory
Dense	100 sq. feet	1000 or over
Medium	70 - 100	250 - 1000
Sparse	Less than 70	less than 250

Size

Sawtimber - main stand 9.0" DBH and over
Pole size - 5.0" - 8.9" DBH
Saplings - 5' high to 4.9" DBH
Seedlings - less than 5' high

Fuels, age, rough, density (extreme / heavy / medium)

eg.: Wire grass, palmetto, gallberry; 10 year extreme

Soil type and topography

eg.: Sandy loam - flatwoods

Seed crop

c. Preburning factors

(Review from block plan form attached)

PLANNING

Mapping - Block maps 2" or 4" to mile scale recommended.

Aerial photographs

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Map Information

1. Areas to be Plowed Out

   (1) Other private lands.

   (2) Plantations or natural reproduction too small to burn.

   (3) Permanent roughs, etc.

2. Plowed Lines

   (1) Location for best burning (illustrate as on sketch).

   (2) Reduce dead heading.

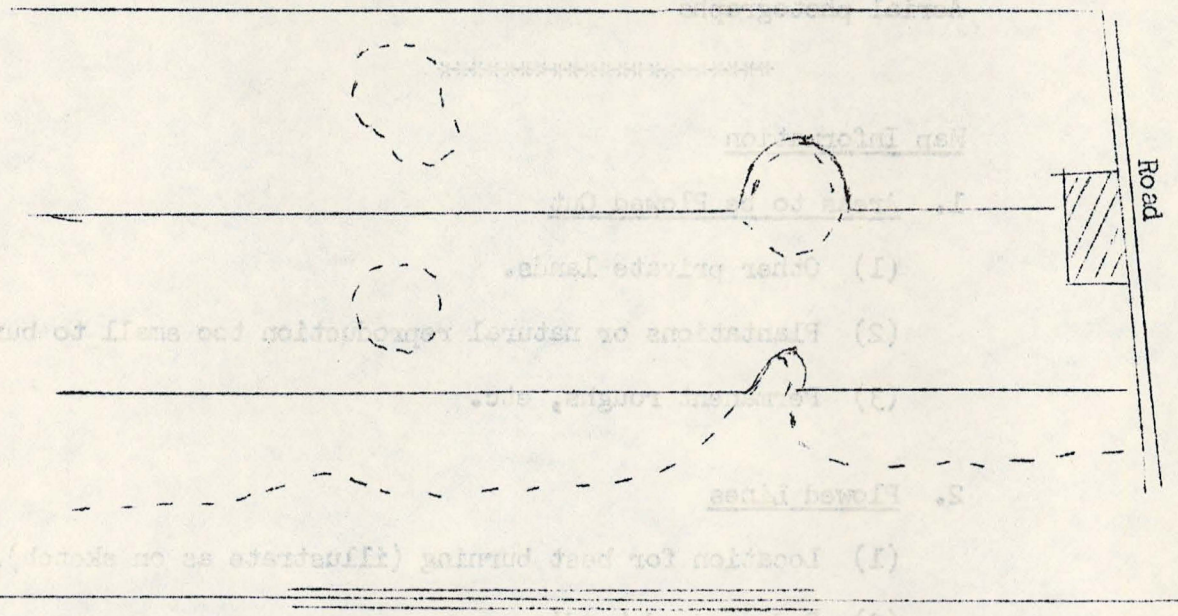
   (3) Lines may be used for next burns or access of 2 disc plow used.

3. Burn Lines

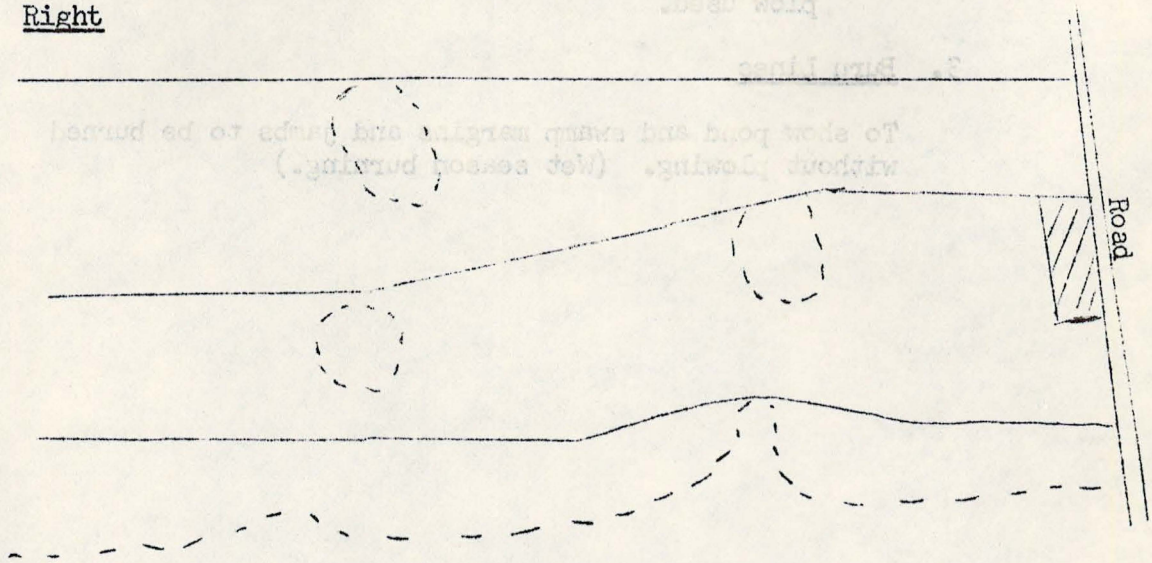
   To show pond and swamp margins and jambs to be burned without plowing. (Wet season burning.)

Location of Plowed Burning Lines

Wrong



Right



------ Natural boundaries, ponds
_____ Plowed lines

Form F-68, R8
Rev. 8-2-51

PRESCRIBED BURNING UNIT PLAN

Forest _____ District _____ Year _____ Comp. _____

Burning Unit No. _____ T. _____ R. _____ Sec. _____

Gross Area _____ Approximate net area _____

(KV Acres _____ KV funds designation _____

A. Purpose:

(1) Brown Spot Control _____ Other Disease Control (Specify) _____

(2) Seed Bed Preparation _____ Planting Preparation _____

(3) Rough Reduction _____ Control Undesirable Species _____

(4) Other (Specify) _____

(If more than one, number in order of importance)

B. Description of Stand:

(1) Overstory-type, density, size _____

(2) Understory-type, density, height _____

(3) Fuels, age rough & density _____

(4) Soil type & topography _____

(5) Seed crop current year _____ Expected next year _____

C. Pre-burning Factors:

(1) Chains line to plow: Interior _____ Exterior _____ Total _____

(2) Chains line to fire: Interior _____ Exterior _____ Total _____

(3) Crew Size (& M.D.) _____ Days since rain _____ Air Temperature _____

(4) Wind direction & velocity _____ Type of fire _____ Month _____

(5) Plow before or at time of burning _____ Burn same day as Unit No. _____

D. Summary of Burn:

(1) Area burned: Gross _____ Net _____ Type fire used _____

(2) Date burned _____ In charge _____

Time set _____ Days since _____ rain _____

(inches)

(3) Weather and fire danger data

at time fire set:	During burning (note times of variations)
Wind direction _____	_____
Wind velocity _____	_____
Wind behavior _____ (variable, gusty, etc.)	_____
Air temperature _____	_____
Fuel moisture _____	_____
Fire danger class _____	_____

(4) Remarks (unusual conditions, height of scorch, success of burn, etc.)

Mapped by _____ Date _____ Reviewed by _____ Date _____

Approved by _____ Date _____ : Approved by _____ Date _____

Form F-68a, R8
Rev. 8-2-51

PRESCRIBED BURNING PLAN SUMMARY

Forest_____ District_____ Year _____

Comp.	Location				Net Acres	Purpose*	Month	Type of Fire	Line		Cost
	Unit	T	R	Sec.					Chains to Plow	Chains to Fire	

*Group by purposes

Form F-68b, R8
(Rev. 9-1-51)

PRESCRIBED BURNING ACCOMPLISHMENT REPORT

_____ National Forest _____ District _____ Year

(1) Gross Area Burned (Acres)	(2) Net Area (Acres)	(3) Total Costs	(4) Cost per acre Col.3 ÷ 2

Total No. Miles Burned Firebreaks	Single/Double Plowing	Total Costs	Cost per mile Col.3 ÷ Col.1

ORGANIZATION

Plowing

1. Leadman, familiar with country and capable of reading maps and aerial photos. (Post actual lines on photos.)

2. Tractor - plow and operator.

3. Transport.

Plowing in advance of burning is recommended on large acreages. Should be done or started after November 15 to reduce effect of needle fall in prepared lines.

Select areas to be plowed so as to reduce mileage on transport.

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Production figures:

Osceola - 1 mile per hour (8 hour day) 8 miles

Florida Forest Service - 1½ mile per hour (10 hour day) 12-20 miles

Florida Forest Service Hourly Rate for F.Y. 1956 Season

$10/hour TD14 or D6 with 4 disc Mathis

$8/hour TD9 or D4 with 2 disc Mathis

$6/hour TD6 or D2 with Hester

$0.25/ mile, one way on small amount of plowing. No charge on large amount.

ORGANIZATION

Backfiring and Control

Men - 1. Backfire boss

2. Torch men - 1 each line

3. Line men - 1 or more each line for patrol and mopup.

Equipment

1. Backfire torches and extra fuel.

2. Flaps or shovels.

3. Transportation

4. Plow unit and/or tanker - if felt needed.

Execution

1. Start line farthest down wind.

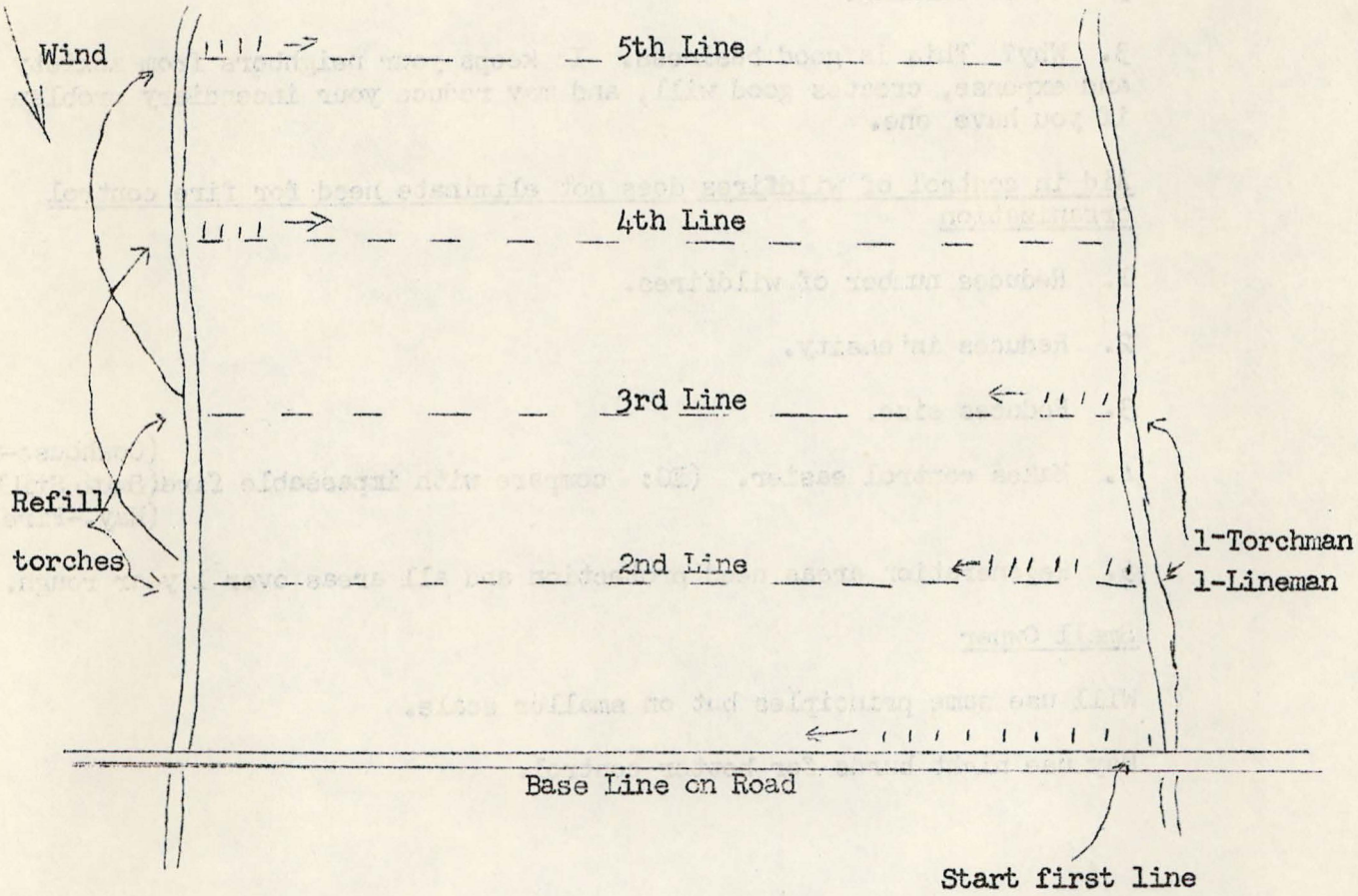
2. Start next lines into wind a little later.

3. As torch men complete lines; refill torches and move to next lines into wind.

4. Maintain constant check of wind behavior.

5. If fire did not burn out to prepared lines and went out during the night, torch men must reset the down wind side of unburned area the next day.

Burning Procedure



Crew - Burning Boss and 4 men

MISCELLANEOUS

Advise neighbors of burning plans

1. Explain and show initial plans, particularly where burning will be done close to neighbors lands.

2. Tell your neighbor and the County Ranger (Forest Service) when you start burning.

3. Why? This is good business. It keeps your neighbors from anxiety and expense, creates good will, and may reduce your incendiary problem if you have one.

Aid in control of wildfires does not eliminate need for fire control organization

1. Reduces number of wildfires.

2. Reduces intensity.

3. Reduces size.

4. Makes control easier. (EG: compare with impassable fire (Cowhouse-wint (Smith Still - 1 (Ray.-Fire st

5. Regeneration areas need protection and all areas over 1 year rough.

Small Owner

Will use same principles but on smaller scale.

May use night burns for better control.